MONTEREY COUNTY

Site name: Elkhorn Slough State Marine Reserve

Year established: 1980
Approximate Area: 1.7 nm^2 **Approximate Shoreline length:** 2.7 nm
Approximate Depth range (feet): 0 to 10

Habitat types: Estuary with soft bottom

Surrounding habitat types: Similar estuarine soft bottom habitat.

Summary of existing regulations: No take is allowed both through State regulations and designation as a Federal National Estuarine Research Reserve.

Primary objectives: This area was originally designated as an ecological reserve. Fish and Game Code Section 1580 (ecological reserves) states that "the policy of the state is to protect threatened or endangered native plants, wildlife, or aquatic organisms or specialized habitat types, both terrestrial and nonmarine aquatic, or large heterogeneous natural gene pools for the future use of mankind through the establishment of ecological reserves." Although the language does not specifically refer to ecological reserves in marine areas, the Fish and Game Commission has extended this policy to those areas. The Elkhorn Slough Ecological Reserve was established to protect sensitive salt marsh, mudflat, and open water habitats, and to provide a quality, undisturbed estuarine site for education, restoration, research and monitoring.

Existing enforcement: The area is easily-observed, well-known, almost surrounded by land, and has a Department of Fish and Game facility on site.

Baseline and ongoing monitoring and research studies: Monthly volunteer water quality monitoring since 1988 at 24 sites around the Slough, including the Reserve. Continuous water quality monitoring, using four sites (two on the Reserve), to measure temperature, salinity, turbidity, dissolved oxygen and pH. Hyperspectral images are being used to map the distribution of plant communities of interest (nuisance algae, eelgrass, pickleweed, native grasses, and noxious weeds). Tidal erosion rates at about 40 intertidal stations along the main channel and in the MPA are monitored annually. Abundance, feeding rates, and reproductive success of herons, egrets, and cormorants in rookeries are assessed by volunteers. Caspian Tern breeding success is being monitored. Distribution, abundance, and diversity of shorebirds and waterbirds at seven ponds and tidal lagoons in the MPA are monitored to detect long-term changes or short-term anomalies. Native and invasive crabs are monitored along the estuarine gradient, in areas of different land use. Tracking of shark and ray abundances occurs at one site in the MPA.
Current research includes: 1) Investigation of use of mudflats and other intertidal habitats by shorebirds, and the influence of tidal and seasonal dynamics. 2) Comparison of invertebrate communities associated with native oyster beds vs. invasive tubeworm beds. 3) Experiments and time series analysis to determine whether invasive upland plants are invading the ecotone and high marsh.

Basic Evaluation: With on-site presence of Department staff, and with a history of baseline monitoring and research studies, the site functions well as one of the few fully-protected estuarine areas in the state.

Published references related to effectiveness of this MPA: 214, 217
Unpublished references related to effectiveness of this MPA: 21
Published references related to use of this MPA as a research tool: 20, 67, 188, 202

Site name: Hopkins State Marine Reserve

Year established: 1984
Approximate Area: 0.15 nm^2 **Approximate Shoreline length:** 0.95 nm
Approximate Depth range (feet): 0 to 60

Habitat types: Mostly granite reef; smaller portions of sand, especially on outside edge

Surrounding Habitat types: Similar

Summary of existing regulations: No take is allowed.

Primary objectives: The primary purpose is to allow for research in an area that is free of disturbance due to exploitation.

Existing enforcement: The area is easily-observed from shore, well-known, marked on the seaward boundary by buoys, and staff from the Hopkins Marine Station is on site every day.

Baseline and ongoing monitoring and research studies: Numerous studies of algae, invertebrates, and fish have taken place. Long-term monitoring of the intertidal zone dates back to the 1930=s. The Department carried out relatively intensive fish counts, and some re-monitoring of those counts has taken place. A recent study was completed comparing counts and sizes of benthic fishes in and adjacent to the MPA. In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has had permanent intertidal and subtidal monitoring sites here for several years.

Basic Evaluation: The area contains one of the oldest fully-protected marine research sites in the state and contains a variety of shallow habitat types within a relatively small area. It is a classic example of how a small but fully protected MPA can function well by providing a multitude of research opportunities with populations of marine organisms occurring at natural densities and size frequencies. While it is relatively small, studies have documented significantly greater biomass and size frequencies of nearshore fishes compared with adjacent fished areas. This site is overlapped by a State Water Quality Protection Area designation.

Published references related to effectiveness of this MPA: 31, 112, 117, 137, 141, 171, 174, 22
Unpublished references related to effectiveness of this MPA: 136
Published references related to use of this MPA as a research tool: 16, 40, 53, 75, 113, 170, 177, 183, 191, 192, 203, 209
Unpublished references related to use of this MPA as a research tool: 4, 52, 76
The Hopkins Marine Station web site presently lists more than 150 student papers dating back to 1964, most of which involved at least some field work or collection or organisms with HMLR. The web site address is: http://www.marine.stanford.edu/HMSweb/marine-indexes.html

Site name: Pacific Grove State Marine Conservation Area

Year established: 1984
Approximate Area: 1.2 nm^2 **Approximate Shoreline length:** 2.5 nm
Approximate Depth range (feet): 0 to 60

Habitat types: Mostly granite reef; smaller portions of sand, especially on outside edge. Rock reefs in deeper water have been surveyed by submersibles.

Surrounding habitat types: Similar, except higher proportion of sand bottom offshore.

Summary of existing regulations:
Only the following species may be taken recreationally: finfish, and invertebrates other than mollusks or crustaceans.

Only the following species may be taken commercially by ring net, lampara net, or bait net: sardines, mackerel, anchovies, squid, and herring.

Primary objectives: Established by legislative action, the primary objective is to provide protection from exploitation for certain fishes and invertebrates.

Existing enforcement: The area is easily-observed from shore by law enforcement personnel as well as private citizens, is well-known, and benefits from an increased community awareness of the need to protect marine resources. During daylight hours thousands of people pass by or visit the area on a daily basis.

Baseline and ongoing monitoring and research studies: Many researchers from Department and several academic institutions have conducted life-history studies, recruitment studies, and tagging studies in this region. Tenera Environmental completed a study in 2003 which investigated the effects of visitor use on the intertidal area and established baseline levels of the more common intertidal species. Submersible studies of deeper-water fishes have also been carried out offshore of this site.

Basic Evaluation: The area presently offers some resource protection since regulations prohibit commercial finfishing (except for pelagic species) and allow the harvest of only certain invertebrates. Among the invertebrate species permitted for take, the presence of the sea otter precludes most harvest by man for some of these (e.g. urchin). However, the area does function well as an MPA by providing recreational opportunities, allowing a low but sustainable level of kelp and recreational finfish harvest, and providing a safe and local site for scientific collecting for research and public education. This area contains extensive intertidal and subtidal reef habitat and provides easy access to intertidal areas from shore. It also provides a source of kelp for local aquaculture businesses. Part of this site is overlapped by a State Water Quality Protection Area designation.

Unpublished references related to effectiveness of this MPA: 99, 100, 101, 118, 142, 195
Published references related to use of this MPA as a research tool: 130
Unpublished references related to use of this MPA as a research tool: 196

Site name: Carmel Bay State Marine Conservation Area

Year established: 1976
Approximate Area: 1.9 nm^2 **Approximate Shoreline length:** 5.8 nm
Approximate Depth range (feet): 0 to 465

Habitat types: Granite reef along rocky shores; extensive areas of sand offshore; some granite pinnacles; head of Carmel submarine canyon

Surrounding habitat types: Similar except for the submarine canyon, which has greater depths than in the MPA.

Summary of existing regulations: Take of all living marine resources is prohibited except the recreational take of finfish by hook-and-line or spear and the commercial take of kelp under specific conditions.

Primary objectives: This area was originally designated as an ecological reserve. Fish and Game Code Section 1580 (ecological reserves) states that "the policy of the state is to protect threatened or endangered native plants, wildlife, or aquatic organisms or specialized habitat types, both terrestrial and nonmarine aquatic, or large heterogeneous natural gene pools for the future use of mankind through the establishment of ecological reserves." Although the language does not specifically refer to ecological reserves in marine areas, the Fish and Game Commission has extended this policy to those areas.

Existing enforcement: The area is adjacent to population centers, and is therefore easily observed from shore. Pleasure boats, dive boats, and party boats frequent the area. Department provides enforcement presence on the water as well as from land.

Baseline and ongoing monitoring and research studies: The area near Pescadero Point, Stillwater Cove, and Arrowhead Point is the focus of a number of marine ecological studies, mostly through Moss Landing Marine Labs. San Francisco State University has conducted life-history and recruitment studies of fish in this area. A high school class carries out an ongoing monitoring program. There have also been submersible studies in the surrounding area. In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has had permanent intertidal and subtidal monitoring sites here for several years.

Basic Evaluation: This area contains reef and sand habitat, a kelp bed, and includes the head of a submarine canyon. It provides opportunities for recreational angling and diving as well as limited commercial kelp harvest but is adjacent to the fully-protected area at Point Lobos. The existing degree of protection is probably consistent with its uses, and the site appears to function well as an MPA with limited harvest. The Department has documented its long term use as a fishing area for recreational anglers on Commercial Passenger Fishing Vessels and in skiffs as well as from extractive free divers (CenCal competitive free-diving competitions). This level of use appears to be sustainable in the absence of commercial fishing for finfish and invertebrates. The presence of the submarine canyon head provides a source of spot prawn recruitment to the commercial trap fishery in the adjacent area. This site is overlapped by a State Water Quality Protection Area designation.

Published references related to effectiveness of this MPA: 57, 175
Unpublished references related to effectiveness of this MPA: 43, 99, 100, 101, 104, 105, 115, 118, 175, 195
Published references related to use of this MPA as a research tool: 36, 66, 69, 70, 71, 74, 86, 90, 151, 181, 194, 204, 207
Unpublished references related to use of this MPA as a research tool: 4, 6, 23, 129, 180

Site name: Point Lobos State Marine Reserve

Year established: 1973
Approximate Area: 0.8 nm^2 **Approximate Shoreline length:** 6.7 nm
Approximate Depth range (feet): 0 to 195

Habitat types: Mostly granite reef dropping form shore to sand bottom. Reef habitat with many crevices and pinnacles. Extensive kelp beds

Surrounding habitat types: Carmel submarine canyon is nearby. Extensive hard bottom offshore, as determined from submersible studies.

Summary of existing regulations: No take is allowed.

Primary objectives: This area was originally designated as an ecological reserve. Fish and Game Code Section 1580 (ecological reserves) states that "the policy of the state is to protect threatened or endangered native plants, wildlife, or aquatic organisms or specialized habitat types, both terrestrial and nonmarine aquatic, or large heterogeneous natural gene pools for the future use of mankind through the establishment of ecological reserves." Although the language does not specifically refer to ecological reserves in marine areas, the Fish and Game Commission has extended this policy to those areas.

Existing enforcement: State Park rangers within the adjacent terrestrial reserve monitor access from shore, and monitor approaches by boats. The presence of visitors every day of the year in the adjacent terrestrial reserve provides an additional deterrent to potential violators of regulations.

Baseline and ongoing monitoring and research studies: UC Santa Cruz students found slightly greater abundances of benthic fish in the MPA than in adjacent areas. Department has conducted habitat-based surveys of fish abundance within the MPA. Submersible surveys have been carried out offshore of the MPA. In addition, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) has had permanent intertidal and subtidal monitoring sites here for several years.

Basic Evaluation: This site contains a complex variety of habitats, primarily hard bottom, and contains high densities of large, adult bottom fishes such as rockfishes and lingcod. Although relatively small, the MPA functions well as a fully protected area because of its high species diversity and variety of habitat, and it is effectively enforced. Studies by the Department and others have documented high population densities and large sizes of economically important nearshore fish species, in particular rockfishes, lingcod, cabezon, and greenlings, with population densities and size frequencies significantly greater than in adjacent and more distant fished areas. In addition, the site is a prime destination for non-extractive scuba divers, and use is limited by local policy. This site is overlapped by a State Water Quality Protection Area designation.

Published references related to effectiveness of this MPA: 12, 72, 111, 137, 167, 198
Unpublished references related to effectiveness of MPAs: 25, 44, 46, 99, 100, 101, 102, 103, 131, 136, 152, 154, 190
Published references related to use of this MPA as a research tool: 58, 59, 78
Unpublished references related to use of this MPA as a research tool: 24

Site name: Julia Pfeiffer Burns State Marine Conservation Area

Year established: 1970
Approximate Area: 2.1 nm^2 **Approximate Shoreline length:** 4.0 nm
Approximate Depth range (feet): 0 to 710 for MPA boundary, which extends 6000 feet offshore, but site-specific regulations apply to the harvest of invertebrates only within 1000 feet from shore, which is approximately 60 feet deep.

Habitat types: Hard and soft bottom. Five sub-categories of habitat: 1) Giant kelp beds; 2) pinnacles and underwater cliffs; 3) Diopatra (worm) tube beds; 4) unstable gravel and boulder fields; 5) surge channels; Some pinnacles have up to 75 ft of vertical relief in over 50 ft horizontally.

Surrounding habitat types: Similar habitats are found to south. To the north, Partington Canyon extends close to shore. Offshore is a mixture of hard and soft bottom, with some depths exceeding 300 fathoms (1,800 ft) within 3 miles of shore.

Summary of existing regulations:
Only the following species may be taken recreationally: finfish, chiones, clams, cockles, rock scallops, native oysters, crabs, lobsters, ghost shrimp, sea urchins, mussels and marine worms except that no worms may be taken in any mussel bed unless taken incidentally to the take of mussels.

Only the following species may be taken commercially: finfish, crabs, ghost shrimp, jackknife clams, sea urchins, squid, kelp and worms except that no worms may be taken in any mussel bed, nor may any person pick up, remove, detach from the substrate any other organisms, or break up, move or destroy any rocks or other substrate or surfaces to which organisms are attached.

Primary objectives: This site was established to protect unique habitat primarily due to prevalence of outstanding wall and pinnacle communities. It contains the most extensive series of pinnacles and underwater cliffs along the Big Sur Coast.

Existing enforcement: Enforcement is aided by the lack of access to intertidal and subtidal area from shore (although fishing from shore occurs at Partington Point) due to park requirements to stay on trails. Department of Park and recreation staff provide on site presence. Department of Fish and Game provides on-water presence. Commercial and recreational harvest restrictions pertain to invertebrates only, and for those which might be taken illegally, access is difficult at best.

Baseline and ongoing monitoring and research studies: Moss Landing Marine Laboratories-extensive diving surveys from 1987 to 1989 with some follow-up in mid 1990's, related to impacts of the massive landslide and subsequent manipulations by Caltrans in 1983-84. Extensive qualitative surveys of plant, invertebrate, and fish communities in five sub-habitat types have been completed. Contacts: John Oliver, MLML, and Jim Barry, Department of Parks and Recreation. Side-scan sonar maps and data are available from the Department of Fish and Game. Surveys were completed by Rick Kvitek in 1994, 1995, 1997, and 1998.

Basic Evaluation: The area presently offers little in the way of resource protection since only certain invertebrates are protected from harvest. Among the allowable species, the presence of the sea otter precludes most harvest by man for some of these (e.g. crab, urchin) or the species is not found here (lobster). However, the area does function well by providing recreational opportunities. The

Department of Parks and Recreation has a long-term data base here, including information on habitat, fishes, invertebrates, and algae. At present, except for Big Creek State Marine Reserve, there are no other complete no-take areas between Pt. Lobos State Marine Reserve, and Vandenberg State Marine Reserve. The northern Boundary of Big Creek State Marine Reserve is about 5 miles from southern boundary of Julia Pfeiffer Burns State Marine Conservation Area. This site is overlapped by a State Water Quality Protection Area designation.

Unpublished references related to effectiveness of this MPA: 18, 100, 101, 104, 178

Site name: Big Creek State Marine Reserve

Year established: 1994
Approximate Area: 1.9 nm^2 **Approximate Shoreline length:** 2.7 nm
Approximate Depth range (feet): 0 to 300

Habitat types: Soft intertidal: est. 10%; Hard intertidal: est. 90%; Soft subtidal: est. 18%; Hard subtidal: est. 82%; Soft shelf: est. 88%; Hard shelf: 12%; Kelp beds; many wash rocks and pinnacles.

Surrounding habitat types: To the north and south a mixture of hard and soft bottom with scattered kelp beds . Several heads of submarine canyons adjacent on seaward side.

Summary of existing regulations: No take is allowed. No disturbance of the bottom; no boats, diving or other use (boat transit only); public entry restricted.

Primary objectives: To satisfy requirements of the Marine Resources Protection Act of 1990 the Fish and Game Commission was required to establish four ecological reserves along the mainland coast. The Big Creek State Marine Reserve (originally named the Big Creek Marine Resources Protection Act Ecological Reserve) was one of the reserves established pursuant to the Act. The Act specified that the specific purpose of these reserves was "to provide for scientific research related to the management and enhancement of marine resources".

Existing enforcement: Full-time reserve manager provides on-site presence. Local users of adjacent areas (skiff fishermen), who are allowed access through the MPA, assist in insuring compliance with regulations. Department provides on-water enforcement presence.

Baseline and ongoing monitoring and research studies: Benthic habitat mapping and characterization: baseline information for entire reserve (Yoklavich, VenTresca). Mapping ocean currents and related hydrographic studies: ongoing research (C. Collins, F. Schwing). Benthic fish surveys: baseline research; deep (Yoklavich), subtidal (VenTresca, Paddock). Benthic Invertebrates; some baseline; intertidal (Pearse); subtidal (Mira Parks). Local Fishery (social aspects; Pomeroy, Smiley). PISCO long-term subtidal monitoring site (Carr)

Basic Evaluation: This site contains a variety of habitats with hard and soft substrates, including kelp beds, and is one of the few existing MPAs which extend to 50 fm depth. This site functions well as a completely protected area while allowing research, particularly the documentation of population densities of nearshore and offshore fishes. Studies by the Department, National Marine Fisheries Service, and others have quantified density and size frequency of populations of rockfishes, lingcod, cabezon, and other economically important finfishes within and outside the MPA boundaries, and have found significant numbers of large, reproductively mature fishes within as well as adjacent to this site. Populations of fishes in adjacent areas are of higher density than within fished areas closer to ports, primarily due to the remoteness of the areas and their difficult access from shore. If fishing pressure increases in the future in adjacent areas, the MPA will continue to serve as a baseline for indices of natural populations. The MPA benefits from the presence of an on-site manager and has excellent enforcement.

Published references related to effectiveness of this MPA: 54, 137, 144, 145, 198, 201, 215, 216

Unpublished references related to effectiveness of this MPA: 58, 59, 60, 64, 102, 103, 106, 115, 136, 139, 143, 152, 153, 154, 155, 156, 157, 158, 182, 196, 197, 210, 216
Published references related to use of this MPA as a research tool: 145, 146